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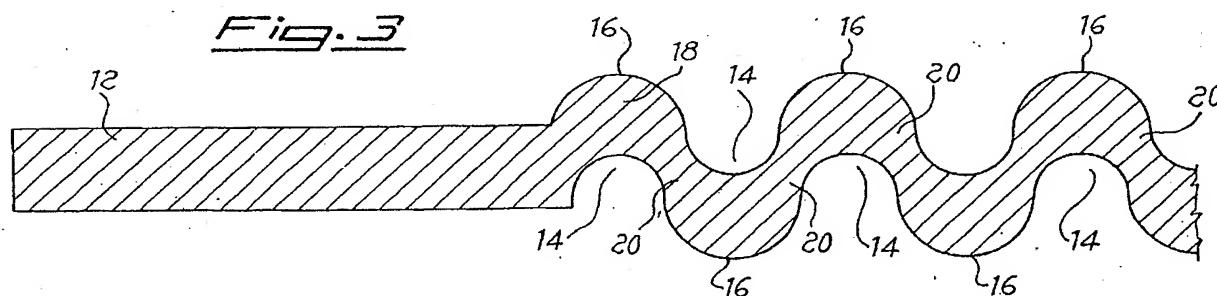
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(54) Component for load-bearing structures, particularly useful for shelves

(57) A component for load-bearing structures (10), particularly suitable for shelves, obtained from metal by bending a sheet (12), and provided, along its lateral surface, with at least a corrugated or sinusoidal zone, formed by the alternation of recesses (14) and protrusions (16) with a substantially circular profile. Said recesses (14) and protrusions (16) have a thickness equivalent to that of said sheet in its rectilinear parts, and are connected by zones (20) having a lower thickness with respect to that of said sheet.



**Description**

[0001] The present invention relates to a component for load-bearing structures, particularly useful for shelves.

[0002] More particularly, the present invention relates to an element or component for load-bearing structures, especially intended for being utilized for the realization of industrial shelves from metal, forming the warehouses of finished products, raw materials, unfinished products and goods in general.

[0003] As is known, the storage of products involves the preparation of specific equipped areas in the inside of building facilities; said areas are sometime fitted out in the inside of, or near to, production factories, or they constitute installations displaced to distribution or handling points for said products. Said areas intended for containing goods are traditionally formed by metal shelves that develop vertically from the floor or the ground surface of facilities intended for storing. Often, they are articulated along several parallel lines, defining passage corridors for automatically controlled means that put in or take out from the different spaces said products that in some cases may be pelletized. The trend that has been followed for a long time is that of vertically developing the structures to be used as warehouses; as a consequence, the shelves utilized are so sized as to be able to support very high loads.

[0004] This requirements concern especially the uprights, i.e. the vertical load-bearing components which are exposed to the highest stresses, especially if shelves are vertically developed for many meters.

[0005] The uprights of the shelves are, in fact, the components that are subject to the highest strains, as all the tensions and weights that burden the superposed shelves of the structure are transferred on them. Theoretically, the load strains that burden the lower part of the uprights are higher than the overlying ones, so that it would be desirable to realize said uprights according to a differentiated structure, i.e., a structure having a resistance and a loading capacity higher at the basis and progressively reduced upwards. However, a solution of this type involves remarkable construction difficulties, mainly due to the box-like shape of the uprights. Besides, such solution causes high wastes of material, with an ensuing increase in the overall production costs.

[0006] In order to overcome these problems, there have been designed components for load-bearing structures - uprights and the like - provided with stiffening ribs obtained during the molding or bending steps of said components. However, also this solution, while being effective, requires a high amount of material to realize the shapes. The development of the basic sheet is, in other words, markedly more extended with respect to the one conventionally used.

[0007] Object of this invention is to obviate the aforesaid drawbacks.

[0008] More particularly, object of this invention is to

realize a component for load-bearing structures, particularly suitable for shelves, having characteristics of high resistance against stresses and loads, without involving construction difficulties for its realization.

5 [0009] A further object of the invention is to provide a component for load-bearing structures as defined above and suitable to present, if necessary, characteristics of high resistance along prefixed zones of its development, at a constant or a differentiated level.

10 [0010] A further object of the invention is to realize a high resistance component for load-bearing structures that does not originate wastes during the production, and such as not to require, as a starting base, a sheet having a higher development with respect to those used traditionally.

15 [0011] A further object of the invention is to provide users with a component for load-bearing structures suitable to ensure a high level of reliability in the time, and also such as to be easily and economically realizable.

20 [0012] These and still other objects, which will be more apparent thanks to the following description, are achieved by the component for load-bearing structures of the present invention, particularly useful for the realization of shelves, obtained from metal by bending a

25 sheet and provided along its lateral surface with at least a corrugated or sinusoidal zone, formed by the alternation of recesses and protrusions with a substantially circular profile, having a thickness equivalent to that of said sheet in its rectilinear parts, connected by zones (20)

30 having a lower thickness with respect to that of said sheet.

[0013] The constructive and functional characteristics of the component for load-bearing structures of the present invention will be better understood thanks to the

35 following description, wherein reference is made to the attached drawings that represent a preferred non limiting embodiment, and wherein:

40 Figure 1 shows a schematic top view of the sheet for the realization of the component for load-bearing structures of the present invention;

45 Figure 2 shows a schematic cross-section of said component for load-bearing structures of Figure 2; Figure 3 shows a schematic partial and magnified cross-section of the same component for load-bearing structures of the preceding figures;

50 Figures 4 and 5 show schematic views of a cross-section of as many alternatives of the component for load-bearing structures of the present invention; Figure 6 shows a schematic portion of the equipment for the realization of the component for load-bearing structures of the present invention.

55 [0014] With reference to the aforesaid figures, the component for load-bearing structures of the present invention, indicated as a whole by 10 in Figure 2, is constituted of a metal structural bar having a substantially quadrangular section, for instance an upright for

shelves.

[0015] Said structural bar, of any length, is obtained by bending a sheet 12 previously cut to measure, to form a body of a box-like shape that is closed and stabilized along its free edges connected by welding stitches.

[0016] According to the invention, along one or more faces of the section bar forming the component for load-bearing structures 10 a plurality of recesses is obtained that have a substantially semicircular profile 14, longitudinally or only partly extended, that gives rise to a sinusoidal or corrugated development of the lateral surface of said section bar. Said recesses 14 are alternated to protrusions 16 having the same substantially semicircular profile, that are cantilevered on the opposite fronts of sheet 12, in its rectilinear parts, according to a direction orthogonal with respect to the longitudinal axis of said sheet. The thickness of said sheet in the zones having a sinusoidal or corrugated development is diversified and results to be greater in correspondence of each of protrusions 16, opposite to a recess 14. The portions having a greater thickness are indicated by 18 in Figure 3, and such thickness approximately corresponds to that of sheet 12 in its rectilinear parts. The connection zones indicated by 20 between each protrusion 16 corresponds to recess 14 have instead a lower thickness with respect to portions 18 and sheet 12 in correspondence of the rectilinear parts.

[0017] The greatest thickness, that concerns each of portions 18, is realized along a direction orthogonal to the longitudinal axis of sheet 12 and with regard to an upright, it concerns therefore only the parts that are more subject to load stresses. Because of the differentiated thickness, a corrugated development of this type does not involve the shortening of the starting sheet 12, as in practice the material is only shifted from one less stressed zone to an adjoining more stressed zone. The connection zones 20 having a lower thickness make up for the amount of necessary material, that would obviously be greater if said zones would have a thickness equal to that of portions 18.

[0018] Recesses 14 and protrusions 16 may have either a constant or a variable pitch; the recesses and protrusions having a constant pitch are preferred.

[0019] Figures 4 and 5 show schematically additional possible configurations of a box-like shaped body suitable to form, for instance, the upright of shelves. In the example of Figure 4, recesses 14 and protrusions 16 that originate portions having a corrugated development concern only partly the opposite box-like shaped body side. In the example of Figure 5 said portions are obtained along the opposite heads defined by the shorter sides of said body. In the example of Figure 5, the box-like shaped body is formed by two complementary half-parts 24, 26, connected with each other by integral flanges 28 with welding stitches or like fastening means.

[0020] Recesses 14 and protrusions 16 are preferably realized by means of a forming machine, known *per se*, provided with couples of rollers like those schematized

by way of example in Figure 6. The rollers suitable to form recesses 14 alternated to protrusions 16 are indicated by 30, 32 in the same figure, and are opposite to each other, with a profile complementary to that of said recesses and protrusions. Sheet 12 is located between said rollers.

[0021] Tests carried out by the applicant have stressed that a component for load-bearing structures provided with one or more corrugated or sinusoidally developed sectors has characteristics of collapse resistance markedly higher with respect to a corresponding traditional component, i.e. a component with a smooth surface.

[0022] As can be inferred from the above description, the advantages that the load-bearing element of the present invention allows to achieve are evident.

[0023] In the component for load-bearing structures of the present invention, the increase in resistance is actual and may be modulated depending on the number, 20 the development and the localization of the corrugated parts obtained along its lateral surface. The creation of said corrugated parts, besides, does not cause a reduction in the development of the body, as the material used is shifted from one to another zone, and the parts subjected to a lower stress that have a reduced thickness made up for the necessary amount of material.

[0024] While the present invention has been described above with reference to some embodiments reported by way of non limiting example, it is evident that 30 modifications and variants will be apparent to those skilled in the art, in the light of the above reported description.

[0025] So, for instance, the solution that has been described above with reference to an upright for shelves, 35 may be utilized for other components of said shelves, such as for instance tie-rods or stringers and shelves.

[0026] It is therefore understood that the present invention intends to comprise all the modifications and variants that fall within the spirit and the protection scope 40 of the following claims.

## Claims

- 45 1. A component for load-bearing structures (10), particularly suitable for shelves, obtained from a metal sheet (12), **characterized in that** said component (10) is provided, along its lateral surface, with at least a corrugated or sinusoidal zones, formed by the alternation of recesses (14) and protrusions (16) with a substantially circular profile; said recesses (14) and profiles (14) having a thickness substantially equivalent to that of the sheet in its rectilinear parts, and being connected by zones (20) having a lower thickness with respect to that of said sheet.
- 50 55 2. The component for load-bearing structures according to claim 1, **characterized in that** said protru-

sions (16) are cantilevered on the opposite fronts of sheet (12) according to a direction orthogonal to the longitudinal axis of said sheet.

3. The component for load-bearing structures according to claims 1 or 2, **characterized in that** said recesses (14) and protrusions (16) have a constant pitch. 5
4. The component for load-bearing structures according to the preceding claims, **characterized in that** it is constituted by a box-like shaped body having a quadrangular section, provided with at least on one of its lateral surfaces with recesses (14) and protrusions (16). 10  
15
5. The component for load-bearing structures according to the preceding claims, **characterized in that** said recesses (14) and protrusions (16) are longitudinally extended. 20
6. The component for load-bearing structures according to any of the preceding claims, **characterized in that** recesses (14) and protrusions (16) form portions having a corrugated profile that concern only a part of the opposite sides of the box-like shaped body. 25
7. The component for load-bearing structures according to any of the claims 1-5, **characterized in that** recesses (14) and protrusions (16) form portions having a corrugated development that concern the opposite heads defined by the shorter sides of the box-like shaped body. 30  
35
8. The component for load-bearing structures according to claim 7, **characterized in that** the box-like shaped body is formed by two complementary half-parts (24, 26) connected to each other by flanges (28) fastened with each other. 40
9. The component for load-bearing structures according to any of the preceding claims, **characterized in that** recesses(14 abd protrusions (16) are obtained by means of a forming machine with shaped rolls (30-32). 45
10. Use of the load-bearing structures according to any of the preceding claims load-bearing structures according to any of the preceding claims for the formation of an upright, a tie-rod and/or a shelf top. 50

Fig. 1

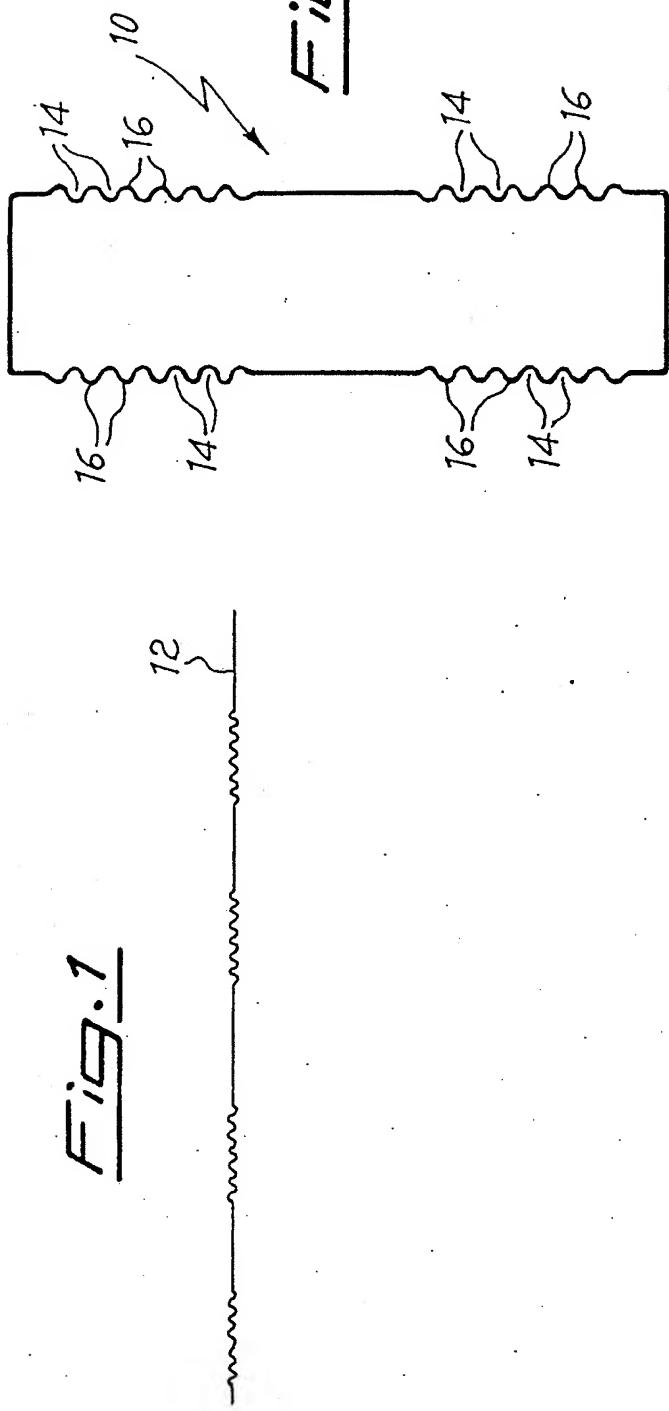


Fig. 2

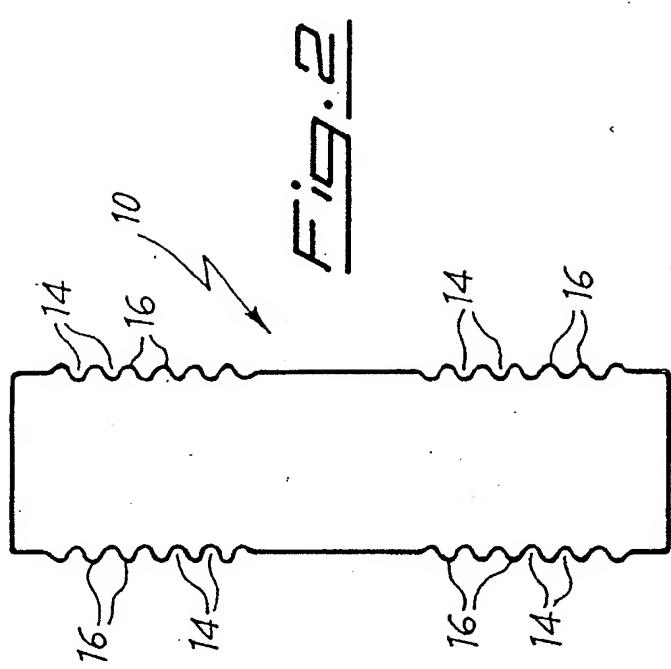


Fig. 3

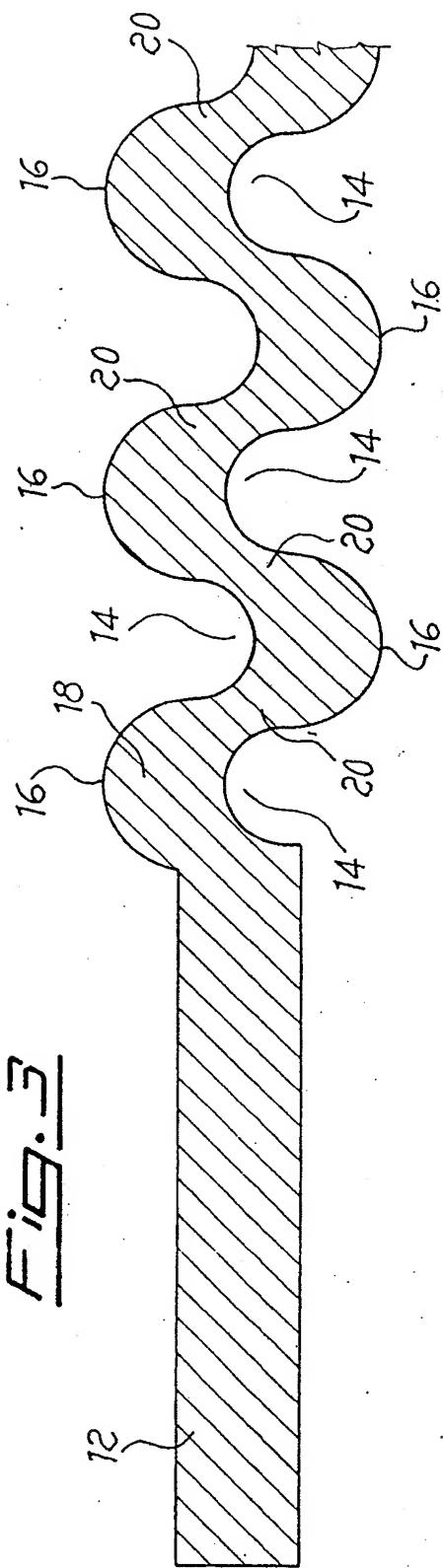


FIG. 5

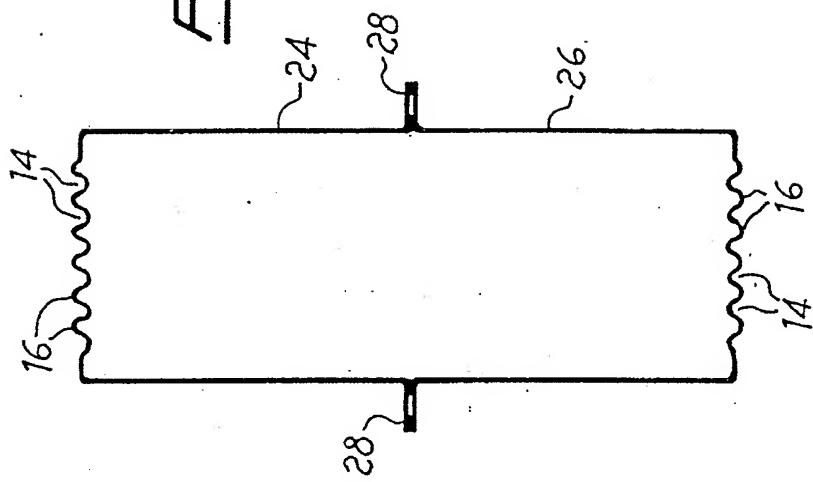


FIG. 4

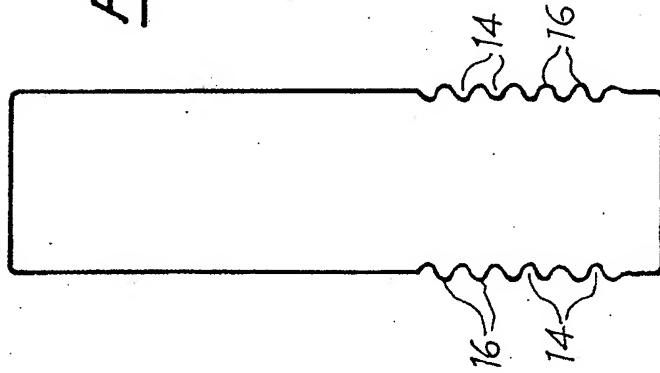
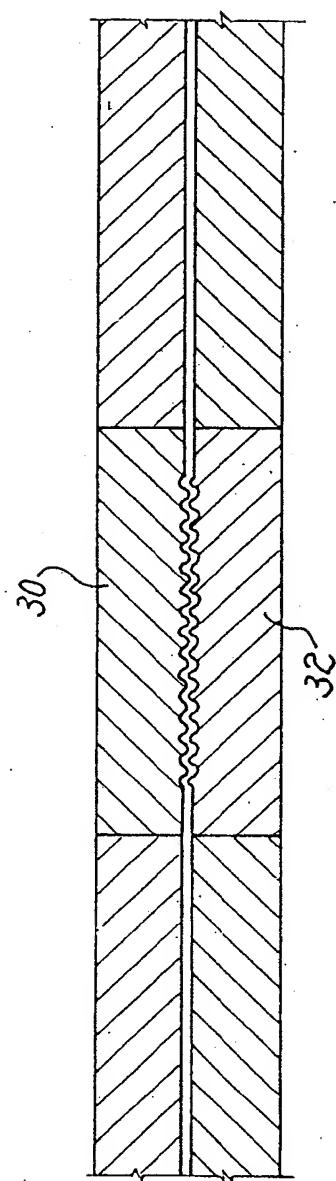


FIG. 6





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## EUROPEAN SEARCH REPORT

Application Number  
EP 01 12 9403

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim			
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)		
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The present search report has been drawn up for all claims					
Place of search	Date of completion of the search	Examiner			
THE HAGUE	26 March 2002	Jones, C			
CATEGORY OF CITED DOCUMENTS					
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document					
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